

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**NUMBER: 03-1-0706 -X****SUBSYSTEM NAME:** MAIN PROPULSION**REVISION:** 1 11/08/00

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : SEALS	ME261-0063-0026
LRU : PACKING	MS9068-016

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

SEALS, GHE 17.3 CUBIC FOOT HELIUM SUPPLY TANK (PREFORM PACKING ENCOMPASSED IN A METALLIC V SEAL).

REFERENCE DESIGNATORS:**QUANTITY OF LIKE ITEMS:** 6

THREE OF EACH PER VEHICLE

ONE OF EACH PER TANK

FUNCTION:

PROVIDES A SEAL BETWEEN THE HIGH PRESSURE HELIUM LINE AND THE HELIUM SUPPLY TANK FOR PREVENTION OF EXTERNAL LEAKAGE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 03-1-0706-01

REVISION#: 1 11/08/00

SUBSYSTEM NAME: MAIN PROPULSION

LRU: METALLIC V-SEAL, HELIUM TANK INLET

ITEM NAME: METALLIC V-SEAL, HELIUM TANK INLET

CRITICALITY OF THIS

FAILURE MODE: 1/1

FAILURE MODE:

RUPTURE/LEAKAGE

MISSION PHASE:

PL PRE-LAUNCH
LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

FATIGUE, MATERIAL DEFECT, DAMAGED SEALING SURFACE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) N/A
B) N/A
C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

RESULTS IN LOSS OF HELIUM FROM THE ENGINE HELIUM SUPPLY. POSSIBLE OVERPRESSURIZATION OF THE AFT COMPARTMENT. POSSIBLE PREMATURE ENGINE SHUTDOWN. EXCESSIVE ENGINE HELIUM TANK AND/OR REGULATOR PRESSURE DECAY WILL BE INDICATED BY SM ALERT OR CAUTION AND WARNING.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0706-01**

DURING ENTRY, VENT DOORS ARE CLOSED TO PREVENT INGESTION OF RCS AND APU GASES. RUPTURE DURING THE TIME PERIOD THAT THE VENT DOORS ARE CLOSED MAY RESULT IN OVERPRESSURIZATION OF AFT COMPARTMENT. VENT DOORS ARE OPENED WHEN VEHICLE VELOCITY DROPS BELOW 2400 FT/SEC.

EXCESSIVE HELIUM LEAKAGE WILL BE DETECTABLE ON GROUND USING HAZARDOUS GAS DETECTION SYSTEM (HGDS).

(B) INTERFACING SUBSYSTEM(S):

SAME AS A.

(C) MISSION:

POSSIBLE LAUNCH SCRUB DUE TO LCC VIOLATION.

(D) CREW, VEHICLE, AND ELEMENT(S):

POSSIBLE LOSS OF CREW/VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

NONE.

-DISPOSITION RATIONALE-

(A) DESIGN:

THE DESIGN UTILIZES A SILICON RUBBER (AMS3304) PREFORMED PACKING (O-RING) NESTLED IN A SILVER PLATED INCONEL 718 V TYPE SEAL. THE SILICON RUBBER TEMPERATURE RANGE IS FROM -65 TO +450 DEG F. THE NESTLED SEAL ASSEMBLY IS INSTALLED IN AN TUBE STEM ADAPTER O-RING GROOVE WHICH PROVIDES A SEAL BETWEEN THE 17.3 CUBIC FOOT HELIUM SUPPLY TANK AND THE ADAPTER.

EXTERNAL LEAKAGE AT THE HELIUM SUPPLY TANK/ADAPTER INTERFACE CAN OCCUR FROM A DAMAGED/DEFECTIVE NESTLED SEAL ASSEMBLY OR DAMAGE TO THE SEALING SURFACE. THE SEALING SURFACE HAS AN 32 MICRON FINISH AND IS EXAMINED PRIOR TO INSTALLATION OF THE NESTLED SEAL ASSEMBLY. THE SEAL JOINT IS PROOF PRESSURE AND LEAK TESTED AFTER INSTALLATION.

(B) TEST:

ATP

EXAMINATION OF PRODUCT

MATERIALS, DIMENSIONS, WORKMANSHIP, CONSTRUCTION, AND IDENTIFICATION

VEHICLE ACCEPTANCE (PALMDALE ONLY)

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0706-01**

PROOF PRESSURE
4500 PSIG

LEAK CHECK
2000 PSIG

CERTIFICATION

THE LINE/TANK INTERFACE SEAL WAS QUALIFIED AS PART OF THE TANK AS FOLLOWS:

PRESSURE CYCLE TEST
1000 CYCLES
PRESSURE RANGE: 0 TO 4500 PSIG
PRESSURANT: WATER AT AMBIENT TEMPERATURE

EXTERNAL LEAKAGE
INTERNAL PRESSURE: 4500 PSIG
MAXIMUM LEAKAGE: 1X10-7 SCC/SECOND OF HELIUM

CREEP TEST
90 DAYS
INTERNAL PRESSURE: 4500 PSIG (HELIUM)
AMBIENT TEMPERATURE

RANDOM VIBRATION
60 MINUTE IN EACH OF 2 AXES
INTERNAL PRESSURE: 4500 PSIG

RADIOGRAPHIC INSPECTION

BURST/RUPTURE TEST
PRESSURIZED UNTIL RUPTURE OCCURS

OMRSD
ANY TURNAROUND CHECKOUT IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
ALL PARTS ARE VERIFIED WITH RESPECT TO MATERIALS, DIMENSIONS, WORKMANSHIP
AND MARKING.

CONTAMINATION CONTROL
CLEANLINESS IS VERIFIED TO LEVEL 100A. PARTS ARE PACKAGED INDIVIDUALLY TO
PREVENT CONTAMINATION AND PROTECT FROM CONTACT DAMAGE.

ASSEMBLY/INSTALLATION
ALL MANDATORY INSPECTION POINTS ARE SET TO VERIFY PRODUCTS AND INSPECT
CRITICAL DIMENSIONS. SAMPLING CHECK ON PRODUCTION BATCH. SURFACE
ROUGHNESS OF THE PARTS IS FINISHED AT 32 RMS.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0706-01**

CRITICAL PROCESSES

HEAT TREATMENT AND SILVER PLATING OF SEALS ARE HANDLED BY OUTSIDE QUALIFIED CONTRACTORS AND CAN BE VERIFIED BY THE CERTIFICATES.

NONDESTRUCTIVE EVALUATION

N/A

TESTING

ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

ALL SEALS ARE WRAPPED AND HEAT SEALED INDIVIDUALLY IN POLYETHYLENE ENVELOPE PRIOR TO DELIVERY.

(D) FAILURE HISTORY:

CURRENT DATA ON TEST FAILURE, FLIGHT FAILURE, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATABASE.

(E) OPERATIONAL USE:

ENGINE HELIUM BOTTLE PRESSURE IS ON A DISPLAY IN COCKPIT. CREW ACTION IS TO FOLLOW NORMAL LEAK ISOLATION PROCEDURE. WHEN UNSUCCESSFUL, CREW WILL INTERCONNECT PNEUMATIC HELIUM SUPPLY.

- APPROVALS -

S&R ENGINEERING	: W.P. MUSTY	:/S/ W.P. MUSTY
S&R ENGINEERING ITM	: P. A. STENGER-NGUYEN	:/S/ P.A. STENGER-NGUYEN
DESIGN ENGINEERING	: EARL HIRAKAWA	:/S/ EARL HIRAKAWA
MPS SUBSYSTEM MGR.	: TIM REITH	:/S/ TIM REITH
MOD	: BILL LANE	:/S/ BILL LANE
USA SAM	: MIKE SNYDER	:/S/ MIKE SNYDER
USA ORBITER ELEMENT	: SUZANNE LITTLE	:/S/ SUZANNE LITTLE
NASA SR&QA	: ERICH BASS	:/S/ ERICH BASS